**Honors Biology Test: Introduction to Genetics**

**Please answer the following essays in complete sentences with as much detail as possible.**

1. Complete all three problems below.
   1. Suppose you found out that mating between a black rabbit and a brown rabbit produced all black offspring. Propose a hypothesis to explain the color of the offspring.
   2. In dogs, the allele for long hair is dominant over the allele for short hair. Two long haired dogs are parents of a litter of 8 puppies. Six have long hair and two have short hair. What are the genotypes of the parents?
   3. In sheep, the allele for white wool is dominant over the allele for black wool. How could you determine the genotype of a white ram, or male sheep?
2. In tomatoes, red fruit color is dominant (R) to yellow (r). Tall vine (T) is dominant to dwarf vine (t). Suppose you crossed a heterozygous tall plant bearing red fruit (heterozygous) with a heterozygous tall plant bearing yellow fruit.
   1. What are the genotypes of the parent?
   2. Predict what the offspring could possibly look like by completing a Punnett Square.
   3. What is the genotypic ratio?
   4. What is the phenotypic ratio?
3. Describe, draw, and label the steps that occur during the process of meiosis. In your drawing of the final phase of meiosis, include a picture of the final results for both a male and a female.
4. Explain the similarities and differences between meiosis and mitosis. Give at least 4 similarities and 6 significant differences.
5. Some alleles are neither dominant nor recessive. Please describe the following situations in which this occurs: codominance, incomplete dominance, polygenic traits, and multiple alleles. With your description, include an example of how this event occurs in a living organism.
6. Human Genome Question:
   1. Provide a gene map of a fruit fly chromosome- have students predict the possibility of crossing-over events to occur.
7. Share two facts about the genetic disorder you researched.